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# BIOLOGICAL SURVEY OF THE SUSQUEHANNA RIVER AND ITS TRIBUTARIES BETWEEN DANVILLE, PENNSYLVANIA, AND CONOWINGO, MARYLAND

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# INTRODUCTION

A biological survey of the Susquehanna River and its tributaries in the reach between Danville, Pennsylvania, and Conowingo, Maryland, was conducted during August and September, 1964. (See Figure 1 following page 28.) The biological activities were conducted concurrently with stream quality investigations.

For purposes of the study, the community of bottom (benthic) organisms was selected as the indicator of the biological condition of the stream. Bottom organisms serve as the preferred food source for the higher aquatic forms and exhibit similar reactions to adverse stream conditions. The combination of limited locomotion and life cycles of one year or more for most benthic species provide a long term picture of the water quality of a stream. Fish and algal populations were given some consideration, but only to the extent that obvious conclusions could be drawn based upon simple observations.

In unpolluted streams, a wide variety of sensitive clean-water associated bottom organisms are normally found. Typical groups are stoneflies, mayflies, and caddisflies. These sensitive organisms usually are not individually abundant because of natural predation and competition for food and space; however, the total count or number of organisms at a given station may be high because of the number of different varieties present.

Sensitive genera tend to be eliminated by adverse environmental conditions (e.g., chemical and/or physical) resulting from wastes reaching the stream. In waters enriched with organic wastes, comparatively fewer kinds (genera) are normally found, but great numbers of these genera may be present. Organic pollution-tolerant forms such as sludgeworms, rattailed maggots, certain species of bloodworms (red midges), certain leeches, and some species of air-breathing snails may multiply and become abundant because of a favorable habitat and food supply. These organic pollution-tolerant bottom organisms may also exist in the natural environment but are generally found in small numbers. The abundance of these forms in streams heavily polluted with organics is due to their physiological and morphological abilities to survive environmental conditions more adverse than other bottom organisms. Under conditions where inert silts or organic sludges blanket the stream bottom, the natural home of bottom organisms is destroyed, causing a reduction in the number of kinds of organisms present.

In addition to sensitive and pollution-tolerant forms, some bottom organisms may be termed intermediates, in that they are capable of living in fairly heavily polluted areas as well as in clean

water situations. These organisms occurring singly, therefore, cannot serve as effective indicators of water quality.

Streams grossly polluted with toxic wastes such as mine drainage will support little if any biological life, and will reduce the population of both sensitive and pollution-tolerant organisms.

Classification of organisms in this report is considered in three categories (clean-water associated, intermediate, and pollution-tolerant) which provide sufficient biological information to supplement physical and chemical water quality data for a basin-wide analysis. Detailed identification and counts of specific organisms have been tabulated for use during intensive investigations of selected areas and are available upon request.

## SUMMARY AND CONCLUSIONS

1. A biological survey of the Susquehanna River and its major tributaries in the reach between Danville, Pennsylvania, and Conowingo, Maryland, was conducted during August and September of 1964. The West Branch Susquehanna was sampled near its mouth to determine the quality of water discharged to the Susquehanna River. A separate study of the West Branch will be carried out during 1965.

2. Bottom organisms were selected as the primary indicator of biological water quality; however, fish and algae were given consideration when observed.

3. In the Susquehanna River between Northumberland and Columbia, Pennsylvania, lateral stream mixing is restricted because of stream width and many longitudinal barriers in the channel, such as islands and rock outcroppings. This reduced mixing causes flow and water quality stratification between the East and West Banks of the River.

4. Analysis of the Susquehanna River was broken into two parts: East Bank and its tributaries, and West Bank and its tributaries. Sampling stations were located along both the East and West Banks of the Susquehanna to better characterize over-all biological water quality and give a biological profile of the River.

5. Shamokin, Mahanoy, Mahantango, and Wiconisco Creeks, which enter from the East side, exert a deleterious effect on the aquatic life of the Susquehanna River. All of these streams were polluted to various degrees with coal fines, mine drainage, and organic wastes. Swatara and Conestoga Creeks, although biologically degraded in certain reaches, were sufficiently recovered at their most downstream reach that little more than a dilution effect on the Susquehanna River was exerted. East Conewago, Chickies, and Pequea Creeks contributed bottom organisms and generally enhanced the water quality of the Susquehanna River.

6. The West Branch Susquehanna River and Codorus Creek were those tributaries entering from the West side which exerted a deleterious effect on the aquatic life of the Susquehanna River. The West Branch is occasionally acidic in quality near its mouth, a condition which consequently extends downstream into the Susquehanna River itself, while Codorus Creek contributes various types of industrial wastes as well as municipal wastes. Penns Creek, the Juniata River, Conodoquinet Creek, Yellow Breeches Creek, and West Conewago, each contributed toward water quality improvement in the Susquehanna River.

7. Downstream from Northumberland, the Susquehanna River on both sides is physiographically well suited to support many kinds of bottom dwelling organisms. In the entire stream reach studied, Northumberland to Columbia, the River did not exhibit any gross biological degradation. Localized impairment to biological quality was observed in the Susquehanna River as a result of the deleterious effects of mine drainage, coal fines, and organic wastes contributed by certain tributaries. Some tributaries, while contributing a waste load, do not exert a noticeable effect because of the relative stream flow magnitudes involved. Other tributaries contributed high quality water and aided biological recovery in the Susquehanna River.

8. Unpolluted biological conditions in the impoundments on the Susquehanna River downstream from Columbia, Pennsylvania, were indicated by known fishery studies; plankton data from above the dams at Holtwood, Pennsylvania, and Conowingo, Maryland; and additional data from the National Water Quality Network Station at Conowingo, Maryland.

## DATA EVALUATION AND INTERPRETATION

In the reach of the Susquehanna River between Northumberland and Columbia, Pennsylvania, lateral stream mixing is restricted because of stream width and many longitudinal barriers in the form of islands and rock outcroppings. Reduced lateral mixing causes flows from tributaries to follow the bank of the main stem and have little influence on the far side of the River.

Evaluation of available water quality data for the Susquehanna indicated significant water quality variation between the East Bank and the West Bank, especially below the confluences of the Juniata River and West Branch Susquehanna. Samples were obtained from both East and West Bank stations to give a complete summary of biological conditions in the Susquehanna River.

Sampling stations were located after consideration of the following conditions:

1. Major tributaries
2. Major waste discharges or sources
3. Physical capability for sampling

In general, tributaries were sampled to determine water quality contributed to the Susquehanna, while waste sources and major tributaries in the study area were bracketed with stations to identify effects of flow and/or waste contributions.

For ease of presentation and to show a profile of biological conditions, stations are discussed proceeding downstream. East and West sides of the Susquehanna River are shown as two separate profiles (Figures 2 and 3, respectively), and tributary streams are discussed in hydrologic order with main stem stations. This allows a better cause and effect evaluation of biological conditions.

### East Bank Susquehanna and Tributaries

#### Main Stem - SUQ - 135 at Danville (E.B.) below Pennsylvania Route 45 Bridge, Montour County

This station was upstream from the confluence of the West Branch. Stratification of flow was not significant, and a single sampling point characterized biological conditions for the entire cross-section of the River. At this point, only four kinds and a

total of 15 bottom organisms per square foot were found. (Table I gives a tabulation of sampling results for the East Bank and tributaries.) Degraded conditions apparently stem from the toxic effects of mine drainage and the presence of coal fines which blanketed the stream bottom, destroying the habitat of many bottom organisms.

Shamokin Creek Basin - 4 stations - enters main stem at mile 120.8

SHM - 022 at Pennsylvania Route 61 Bridge, Northumberland County

Thirteen kinds of bottom organisms were collected, with 170 organisms per square foot in the quantitative sample. The reach of stream above this station was of high quality, as indicated by the presence of the following genera: caddisflies (the dominant form), two kinds of mayflies, fishflies, and riffle beetles.

SHM - 019 at Foot Bridge, Weigh Scales, Pennsylvania (U.S.G.S. Gaging Station I-5545) Northumberland County

Degraded biological conditions existed downstream at stream mile 19, where only one kind of midge was found. The water was black in color. Abundant coal fines blanketed the bottom, and the rocks were coated with iron compounds.

BUD - 000 at LR49033 Bridge, Northumberland County

Buddy's Creek is a tributary of Shamokin Creek at stream mile 17.6. Sludge beds were observed at the mouth of this tributary, indicating organic pollution. Most forms were pollution-tolerant or intermediate kinds. Eight genera were present, with a population of 500 per square foot.

SHM - 000 at Pennsylvania 147 Bridge, South of Sunbury, Northumberland County

At the mouth of Shamokin Creek, only small numbers of a pollution-tolerant midge were found. Shamokin Creek contributes heavy coal fines, sewage, and mine drainage to the Susquehanna River.

Main Stem - SUQ - 120 at Hummels Wharf (E.B.)

Water quality in the Susquehanna between Danville and Hummels Wharf showed some improvement, as two additional types of organisms were present with a significant increase in total population to 241

per square foot. The pollution contributed by Shamokin Creek reduced the amount of biological recovery.

Mahanoy Creek Basin - 3 stations - enters main stem at mile 112

MAH - 009 at Dornsife Feed Dam, Pennsylvania Route 225 Bridge, Northumberland County

At stream mile 8.9 on Mahanoy Creek, four kinds of bottom organisms were collected, and total population was only four per square foot. Iron compounds were observed on the rocks, and coal fines were in abundance, accounting for the degraded conditions.

SCH - 000 at Pennsylvania Route 225 Bridge, Northumberland County

Schwaben Creek, a tributary which enters Mahanoy Creek at stream mile 6.2, exhibited unpolluted biological conditions, as evidenced by the 12 kinds of bottom organisms found. These included two kinds of clean-water associated caddisflies, three kinds of mayflies, and fishflies.

MAH - 001 at Pennsylvania Route 147 Bridge, North of Herndon

Only three kinds of bottom organisms were found at this station. The water was black from coal fines, and iron compounds were deposited on the rocks. Mahanoy Creek contributes high concentrations of coal fines and mine drainage to the Susquehanna River; however, the effects on the Susquehanna are limited because of dilution in the much larger flow.

Main Stem - SUQ - 106 at McKee Half Falls (E.B.)

Between Hummels Wharf and McKee Half Falls, the Susquehanna continued to recover biologically. Seven kinds of organisms were present, with 353 organisms per square foot.

Mahantango Creek Basin - 6 stations - enters main stem at mile 102.5

MAN - 018 at LR53047 Bridge, Klingerstown, Pennsylvania

This station is 0.4 miles upstream from Pine Creek, the principal tributary. Unpolluted stream conditions were indicated by the 13 kinds of bottom organisms found, which included three kinds of clean-water associated caddisflies and two kinds of mayflies.

PNE - 019 at LR53030 Bridge, Fountain, Pennsylvania

Pine Creek, which is actually the longest fork of Mahantango Creek, was sampled at stream mile 19, where only four kinds of bottom organisms were collected. All genera were clean-water associated, including two kinds of mayflies, one kind of caddisfly, and one kind of riffle beetle. Unpolluted biological conditions were indicated.

DCR - 009 at Pennsylvania Route 125 Bridge, North of Hegins, Schuylkill County

Deep Creek, a tributary to Pine Creek, was sampled nine miles upstream from the confluence and found to support clean-water associated bottom organisms including stoneflies, mayflies, and caddisflies.

PNE - 001 at T-379 Bridge, Klingerstown, Pennsylvania

Pine Creek, at Klingerstown, Pennsylvania (stream mile 1), was sampled, and the number of kinds of bottom organisms was reduced to one form (Sialis) which is tolerant of acid stream conditions. The water was very clear, and iron compounds were noted on the rocks. Both mine drainage and garbage were observed in the stream.

MAN - 010 at LR22058 Bridge, East of Pillow (Uniontown), Pennsylvania

In Mahantango Creek, downstream from the Pine Creek confluence, the number of kinds had been reduced from 13 to two, with one kind present being the acid-tolerant Sialis genera. The water was exceptionally clear, and iron compounds were on the rocks. This degradation was attributed to the influence of Pine Creek, which joins the Mahantango at stream mile 17.4.

MAN - 000 at Pennsylvania 147 Bridge, West of Malta, Northumberland County

The last station on Mahantango Creek was located just above its confluence with the Susquehanna River, and again only two kinds of bottom organisms, with a population of only two per square foot, were found. This stream contributed some mine drainage to the Susquehanna.

Wiconisco Creek Basin - 2 stations - enters main stem at mile 96.1

WIS - 038 at LR53025 Bridge, South of Tower City, Schuylkill County

At this station, no bottom organisms were found. The bottom was covered with coal fines, and iron compounds were deposited on the rocks. Mine drainage was indicated.

WIS - 000 below Mill Race at Millersburg, Pennsylvania, Dauphin County

Near the mouth of Wiconisco Creek, six genera were identified. Considerable biological recovery had taken place to the point that three kinds of clean-water associated caddisflies and one kind of mayfly were present. This stream contributes some coal fines to the Susquehanna River.

Main Stem - SUQ - 089 New Buffalo (E.B.), approximately 0.5 mile upstream

This station yielded 12 kinds of bottom organisms, with a population density of 422 per square foot. Of this population, 401 were clean-water associated caddisflies. Water quality in the Susquehanna River, as measured by biological life, showed a gradual improvement from the first station at Danville to this station.

This improvement can be measured by the increased organism diversity (12 vs. four) and substantially increased bottom organism population (422 vs. 15).

Main Stem - SUQ - 075 above Harrisburg (E.B.), approximately 0.5 mile downstream from Rockville Bridge

This station was above Harrisburg and below the confluence of the Juniata River which enters on the West Bank. A substantial reduction was observed in kinds and number of bottom organisms between the New Buffalo and the Harrisburg stations. Only nine organisms per square foot were found, representing six genera. The most probable cause of degradation was a transfer of West Branch Susquehanna stream flow, which had previously followed the West Bank of the Susquehanna, toward the East Bank with the entrance of the Juniata River. The variable quality of flows from the West Branch Susquehanna, normally mildly alkaline, but occasionally acidic, periodically results in conditions toxic to bottom organisms.

Main Stem - SUQ - 064 at Pennsylvania Turnpike Bridge (E.B.), Highspire, Pennsylvania

In the stream reach between Harrisburg and the Turnpike Bridge, biological conditions improved slightly. A larger population was

observed (35 vs. nine), while the number of kirds increased from six to eight.

Swatara Creek Basin - 8 stations - enters main stem at mile 60

SWA - 066 at U. S. 209 Bridge, Newtown, Pennsylvania, Schuylkill County

Swatara Creek was first sampled at stream mile 66.4, where only single specimens of two kinds of bottom organisms were present, including the acid-tolerant Sialis genera. Iron compounds, mine drainage, and coal fines were present at this station.

SWA - 055 at Pennsylvania 443 Bridge, Pine Grove, Schuylkill County

At this station, Swatara Creek had recovered sufficiently to support six genera of bottom organisms which included such clean-water associated forms as mayflies and caddisflies. Several kinds of fish were also observed.

SWA - 054 at Pennsylvania 895 Bridge, near Pine Grove, Schuylkill County

At stream mile 54, all bottom organisms were eliminated. Organic pollution, mine drainage, and coal fines from the Pine Grove, Pennsylvania, area were the cause of this biological degradation.

SWA - 038 at U. S. 22 Bridge, above Jonestown, Pennsylvania, Lebanon County

This station is just above the confluence of Little Swatara Creek. Biological conditions showed some recovery, with three kinds of organisms present.

LSW - 011 at LR06004 Bridge, below Frystown, Pennsylvania, Berks County

Little Swatara Creek, which joins Swatara Creek at stream mile 37.2, was sampled 11 miles upstream from the confluence and was found to support an unpolluted bottom organism population of ten different kinds, but a population of only 62 per square foot at this point.

LSW - 001 at T422 Bridge, South of Jonestown, Pennsylvania, Lebanon County

One mile above the confluence with Swatara Creek, the number of kinds had increased to 13 and the population to 103 organisms. Clean-water associated forms present included mayflies, caddisflies, gill-breathing snails, and "Unio" mussels. Little Swatara contributes good quality water to Swatara Creek.

SWA - 014 above Pennsylvania Route 39 Bridge, west of Hershey

Biological conditions at this sampling station on Swatara Creek were improved, reflecting the influences of Little Swatara Creek, as well as natural biological recovery. Bottom organisms increased from three to eight genera, and the population rose from three to 181.

SWA - 002 at U. S. 230 Bridge, near Middletown, Pennsylvania

This last station sampled on Swatara Creek, at mile 2, supported 11 different kinds of organisms, which included such clean-water associated forms as mayflies, caddisflies, and two kinds of gill-breathing snails. The bottom organisms community was nearing recovery at this point, and water quality from this stream would not be expected to significantly affect the water quality in the Susquehanna River.

East Conewago Creek - 1 station - enters main stem at mile 56.4

CNE - 006 at U. S. 230 Bridge, north of Elizabethtown, Pennsylvania, Lancaster County

This stream was sampled at only one station six miles upstream from the mouth. A total of 13 different kinds of bottom organisms were present, including three kinds of mayflies, caddisflies, and fishflies. Mayflies were the dominant form, representing about 56% of the total population of 170. This stream exhibited unpolluted biological conditions.

Main Stem - SUQ - 045 above Columbia (E.B.) at U.S.G.S. Gaging Station, Lancaster County

Biological conditions continued to improve in this reach of the Susquehanna, as nine genera were found here with a population of

148 per square foot. Of these bottom organisms, 73 were clean-water associated mayflies. This was the last East Bank station on the main stem of the Susquehanna River because of downstream impoundment depths created by the hydro-electric dams at Safe Harbor and Holtwood, Pennsylvania, and Conowingo, Maryland. Studies by the Pennsylvania Fish Commission and the Maryland Department of Research and Education in connection with the Susquehanna Electric Company indicate that a well-balanced game fish population exists in these impoundments. Unpolluted biological conditions were also indicated by the plankton samples which were collected above Holtwood Dam and Conowingo Dam and additional data from the National Water Quality Network at Conowingo.

Chickies Creek Basin - 1 station - enters main stem at mile 44.3

CHI - 001 at Pennsylvania Route 340 Bridge, Lancaster County

Only one station was sampled on this creek, at stream mile 1.3. Nine different kinds of bottom organisms, including clean-water associated forms such as caddisflies, riffle beetles, and mayflies, were abundant. Biological conditions indicated good quality water is contributed to the Susquehanna.

Conestoga Creek Basin - 6 stations - enters main stem at mile 31.7

CON - 031 at Pennsylvania Route 772 Bridge, Brownstown, Lancaster County

The uppermost station on this creek was located at stream mile 31 and was found to exhibit healthy biological conditions. Fifteen different kinds of bottom organisms were found, including two kinds of mayflies, caddisflies, and gill-breathing snails. An extensive amount of fishing activity was also observed.

COL - 001 at T-797 Bridge, Lancaster County

Cocalico Creek, a tributary which enters Conestoga Creek immediately downstream from this sampling station, also exhibited unpolluted biological conditions.

CON - 024 at Pennsylvania 23 Bridge near Holland Heights, Lancaster County

This Conestoga Creek station was located at mile 24. Some biological degradation was indicated by a reduction in the number of kinds of bottom organisms (from 15 to 8); however, clean-water associated forms were still present.

CON - 013 at Pennsylvania Route 324 Bridge, Lancaster County

This station, at mile 13, is downstream from Lancaster, Pennsylvania, and it exhibited considerable biological degradation. Only three kinds of bottom organisms were found, with an organic pollution-tolerant type of midge (Chironomus riparius) constituting 81 of the 83 organisms obtained in the quantitative sample.

CON - 012 at T-504 Bridge, below Lancaster, Pennsylvania

Partial biological recovery was indicated at the next station, located at stream mile 12. Seventeen kinds of bottom organisms were obtained. Although sludgeworms were the most abundant organisms (113 of 279 per square foot), clean-water associated caddisflies were also present in significant numbers.

CON - 001 at Safe Harbor, Pennsylvania, Lancaster County

The last station on Conestoga Creek was located one mile upstream from the mouth, where 14 kinds of bottom organisms were found. Some pollution-tolerant forms, such as midges and sludgeworms, were still present; however, unpolluted conditions were indicated at this station by the abundance of such clean-water associated forms as mayflies and caddisflies. This stream is very near complete biological recovery at this point.

Pequea Creek Basin - 2 stations -- enters main stem at mile 29.5

PEQ - 006 at Pennsylvania Route 324 Bridge, Lancaster County

The uppermost station was located at stream mile 6 and was found to support eight kinds of bottom organisms, with the dominant form being clean-water associated caddisflies and mayflies.

PEQ - 001 one mile below Colemanville, Pennsylvania, Lancaster County

The last station located on Pequea Creek, at stream mile 1, showed a slight reduction to six kinds of bottom organisms; however, mayflies and caddisflies remained the dominant forms. Unpolluted biological conditions were indicated, and good quality water is contributed to the Susquehanna.

## West Bank Susquehanna and Tributaries

Main Stem - SUQ - 135 at Danville (W.B.) below Route 45 Bridge, Montour County

This station was upstream from the confluence of the West Branch. Stratification of flow was not significant, and one sampling point characterized biological conditions for both sides of the stream. At this point, only four kinds of bottom and a total of 15 organisms per square foot were found. (Table II gives a tabulation of sampling results for the West Bank.) Degraded conditions apparently stem from the toxic effects of mine drainage and the presence of coal fines which blanketed the stream bottom, destroying the habitat of bottom organisms.

West Branch Susquehanna River - 1 station - enters main stem at mile 123.8

(The West Branch was sampled only once near the mouth during this sampling period. A detailed study of the West Branch is now underway.)

WBS - 008 at Pennsylvania Route 45 Bridge, Lewisburg, Union County

The West Branch Susquehanna River was sampled at Lewisburg, Pennsylvania, prior to its juncture with the main stem. The River at this point was subject to some organic waste loading and occasional acidic conditions. As an example, a pH as low as 4.6 has been recorded at this station. Twelve kinds of bottom organisms were found on the West side, with a population density of 49 per square foot; however, bottom organisms were not found on the East side. The West Branch Susquehanna River contributes very little toward the improvement of water quality in the Susquehanna River.

Main Stem - SUQ - 120 at Hummels Wharf (W.B.)

This was the first West Bank station sampled, and it was located downstream from Northumberland, Pennsylvania. Five kinds of bottom organisms were found, with a population of 1,232 per square foot. This was the most productive main stem station, with the dominant genera being the clean-water associated caddisfly, Hydropsyche sp. (1,120 per square foot). This high population of Hydropsyche sp. was attributed to an absence of clean-water predators.

Penns Creek Basin - 3 stations - enters main stem at mile 113.6

PEN - 006 about one mile above U. S. 11 and 15, Snyder County

The uppermost station on Penns Creek was located at stream mile 6 and was found to support 17 different kinds of bottom organisms. These included such clean-water associated forms as caddisflies (five kinds), mayflies (three kinds), stoneflies, hellgrammites, and gill-breathing snails (two kinds), making up a population of 40 organisms per square foot. High water quality was indicated at this station.

MID - 001 about one mile above U. S. 11 and 15 Bridge, Snyder County

Middle Creek, which enters Penns Creek at stream mile 2, was sampled near its mouth and found to contain 23 different kinds and 427 organisms per square foot. Because of organism diversity, this station was the outstanding biological station encountered in this study. Clean-water associated forms included three kinds of caddisflies, mayflies, and hellgrammites. Middle Creek contributes good quality water to Penns Creek.

PEN - 000 south of Selinsgrove, Pennsylvania, Snyder County

The last station on Penns Creek was located immediately upstream from the mouth, and here the number of kinds had been reduced to nine. Although this stream still supported many clean-water associated forms, some biological degradation had occurred, primarily as a result of organic pollution from the Selinsgrove area. Good quality water is being contributed to the Susquehanna.

Main Stem - SUQ - 106 at McKee Half Falls (W.B.)

At McKee Half Falls, Pennsylvania, the number of kinds of bottom organisms increased from five to ten, attributable to the beneficial effects of Penns Creek and the presence of predacious forms of bottom organisms which reduced the caddisfly population. The bottom organism population was 520 per square foot. The appearance of clean-water associated groups, such as stoneflies, mayflies, and hellgrammites, indicated an improvement in biological conditions over the Hummels Wharf station.

Main Stem - SUQ - 089 New Buffalo (W.B.), about 0.5 mile upstream

This station showed continued improvement, with an increase in the variety of organisms from ten to 11 in the stream reach between McKee Half Falls and New Buffalo. West Mahantango, an unpolluted stream, enters the Susquehanna in this reach and contributes to the improved conditions.

Juniata River Basin - 23 stations - enters main stem at mile 84.5

LJU - 127 at Bellwood, Pennsylvania, Blair County

Upstream from its junction with the Frankstown Branch, the Juniata River is known as the Little Juniata River. The uppermost biological station was located at Bellwood, Pennsylvania. Biological degradation from organic pollution was indicated, as sludgeworms were the only bottom organisms present. Coal fines were also observed, and the water was a cloudy blue-gray.

LJU - 122 at U. S. 220 Bridge, Tipton, Pennsylvania, Blair County

This station was located downstream at Tipton, Pennsylvania. Some biological improvement was indicated, as four kinds of bottom organisms were found, including the crayfish Cambarus sp. The other organisms were sludgeworms, Physa snails, and another air-breathing snail, Ancylus, which are pollution tolerant.

LJU - 118 at Tyrone, Pennsylvania, Blair County

At stream mile 118, just above the confluence of South Bald Eagle Creek, additional improvement had occurred. Six kinds of bottom organisms were collected, with the dominant form a clean-water associated mayfly. Population at this station was 19 organisms per square foot.

SBE - 003 at Pennsylvania Route 350 Bridge

In Tyrone, South Bald Eagle Creek enters the Little Juniata River at stream mile 117.4. This creek was first sampled three miles upstream to its mouth and was found to support nine kinds of bottom organisms, with a population of 263 per square foot. These genera included clean-water associated mayflies (three kinds), caddisflies (two kinds), and stoneflies.

SBE - 000 at Pennsylvania Route 350 Bridge, Tyrone, Pennsylvania

South Bald Eagle Creek was sampled again near its mouth, where only two kinds of bottom organisms were obtained (a midge and an organic pollution-tolerant air-breathing snail). A temperature rise of 10° Centigrade over the upstream station was noted. This tributary contributes thermal pollution (heat) and some organic loading to the Little Juniata River.

LJU - 108 at Pennsylvania Route 45 Bridge, Spruce Creek Village, Huntingdon County

About ten miles downstream from the confluence of South Bald Eagle Creek, the Little Juniata River was sampled again. The number of kinds had been reduced to two, compared to six at stream mile 118. Both kinds of organisms were organic pollution-tolerant snails. A combined sanitary and paper waste discharge is located in this reach.

SPR - 000 at LR31058 Bridge, Spruce Creek Village, Huntingdon County

Spruce Creek was sampled just above its confluence with the Little Juniata River. Excellent biological conditions were indicated by the bottom organism population of 19 kinds and 127 per square foot. Clean-water forms included mayflies (three kinds), stoneflies, and caddisflies.

FBJ - 039 at Pennsylvania Route 164 Bridge, McKee, Pennsylvania

The Frankstown Branch enters the Juniata River at stream mile 101.6. The first station sampled was located 39 miles upstream from its mouth. Seven kinds of bottom organisms were found, including clean-water associated forms (caddisflies and mayflies). Bottom organism population at this station was 118 per square foot.

FBJ - 038 at Pennsylvania Route 36 Bridge, below Vicksburg, Pennsylvania

The Frankstown Branch was sampled just below the mouth of Halter Creek, a tributary. Biological degradation was indicated by a predominance of organic pollution-tolerant forms such as the midge (Chironomus riparius) and a leech in the quantitative sample. Although the number of kinds increased to nine, and the population to 532 per square foot, clean-water forms found at the upstream station were absent. Halter Creek conveys paper mill waste to the Frankstown Branch in this reach.

FBJ - 021 between Ganister, Pennsylvania and Junction of U. S. 22 and Pennsylvania Route 866

The next station on the Frankstown Branch was located at stream mile 21 and about 11 miles downstream from the confluence of the Beaverdam Branch, a tributary which originates in the Altoona area. Although nine kinds of bottom organisms were obtained, only pollution-tolerant sludgeworms and leeches, plus fingernail clams were found in the quantitative sample. Little biological change occurred from conditions at stream mile 38, primarily because of the pollution contributed by the Altoona area.

FBJ - 016 near Williamsburg, Pennsylvania

This station was located about 0.75 mile downstream from Williamsburg, Pennsylvania. The number of kinds of organisms remained essentially the same (eight vs. nine at mile 21); however, organic pollution-tolerant Physa snails and leeches predominated.

FBJ - 004 at Pennsylvania Route 305 Bridge, Alexandria, Pennsylvania

The last station on Frankstown Branch was located four miles above the confluence with the Juniata. Considerable biological improvement was indicated by the increase in kinds of organisms from eight to 12. Although pollution-tolerant forms were still present, clean-water associated forms such as mayflies, riffle beetles, and gill-breathing snails were also collected.

JUN - 094 at A-135 Bridge, Huntingdon, Pennsylvania

The Juniata River was sampled eight miles downstream from the confluence of the Frankstown Branch. The number of kinds of bottom organisms had increased from two to six in the stream reach between mile 108 and mile 94. Biological improvement was also indicated by the presence of Pleurocerca, a clean-water snail; however, organic pollution-tolerant midges (42), leeches (three), and an air-breathing snail (ten) made up most of the bottom organisms in the quantitative sample.

RBJ - 043 at Pennsylvania Route 913 Bridge, near Saxton, Pennsylvania

The Raystown Branch enters the main stem of the Juniata River at stream mile 91. This branch was first sampled 43 miles upstream from its mouth. Thirteen kinds of bottom organisms were obtained, including many clean-water associated forms such as mayflies, caddisflies, riffle beetles, and "Unio" mussels. Although the dominant form of the population (48 per square foot) was sludgeworms, relatively unpolluted conditions were indicated.

RBJ - 024 about 0.75 mile above LR31059 Bridge, Huntingdon County

The next station downstream, at stream mile 24, exhibited some biological improvement, as indicated by a change of the dominant form to a clean-water associated gill-breathing snail. Population and number of genera were almost constant. Stoneflies, mayflies, and caddisflies were also found. The entrance of Trough Creek is primarily responsible for the improvement.

RBJ - 009 at Hauns Bridge, intersection of Township Roads 430 and 431

The last station on Raystown Branch was located just below the Hauns Bridge Dam and nine miles above the confluence with the Juniata River. At this station, the number of kinds of bottom organisms had been reduced to nine; however, clean-water associated caddisflies were the dominant form in the quantitative sample, which had a population of 241 per square foot. Mayflies, fishflies, and gill-breathing snails were also found. Although a reduction in the number of kinds occurred from the upstream station, an increased variety of clean-water associated forms indicates that unpolluted biological conditions still exist.

JUN - 082 at U. S. 522 Bridge, Mt. Union, Pennsylvania

The main stem of the Juniata River was sampled again at stream mile 82, nine miles downstream from the confluence of the Raystown Branch. The number of kinds of bottom organisms increased to 13, as compared to six at the upstream station (stream mile 94). In addition, the dominant form changed from an organic pollution-tolerant type (midge) to a clean-water form (gill-breathing snail Pleurocerca). Four other clean-water associated forms were found. This substantial biological improvement is due largely to the influence of the Raystown Branch.

AUG - 030 at Pennsylvania Route 475 Bridge, near Maddensville, Pennsylvania

Aughwick Creek enters the Juniata at mile 77.7. The first sampling station on this tributary was located 30 miles upstream from its mouth. Fourteen kinds of bottom organisms were obtained, including many clean-water forms. Unpolluted biological conditions existed at this station.

AUG - 005 at U. S. 522 Bridge, near Shirleysburg, Pennsylvania

Little change in biological conditions was indicated at this station, as the number of kinds was 13 vs. 14 upstream, and the

population increased from 54 to 75. The variety of clean-water forms also indicated this tributary contributes high quality water to the Juniata River.

JUN - 052 near Granville, Pennsylvania,Mifflin County

At stream mile 52, the number of genera was 12. This compares favorably to the 13 kinds found upstream at mile 82, while a substantial increase in the variety of clean-water associated forms shows a definite improvement in water quality. Mayflies were the dominant form in the quantitative sample.

KIS - 006 at U. S. 322 Bridge, above Yeagerstown, Pennsylvania

Kishacoquillas Creek enters the Juniata River at stream mile 46.8. The first biological station located on this tributary was at stream mile 6, and this station exhibited unpolluted biological conditions. Ten kinds of bottom organisms were found, including caddisflies and three kinds of mayflies. Extensive fishing activity was observed.

KIS - 000 at U. S. 322 Bridge, at Lewistown, Pennsylvania

This station was just above the mouth of Kishacoquillas Creek. Marked biological degradation was shown by the reduction of genera to seven, with organic pollution-tolerant types such as sludgeworms, midges, and Physa snails making up the entire population of 471. Organic pollution from the Lewistown area contributed to the degradation.

JUN - 012 at Pennsylvania Route 34 Bridge, Newport, Pennsylvania

The last station on the Juniata River was located at Newport, Pennsylvania, where unpolluted biological conditions were observed. Twenty kinds of bottom organisms were found,with a population density of 221 per square foot. Clean-water forms included caddisflies, hellgrammites, and two kinds of mayflies. This represents a substantial improvement over the upstream station. The Juniata contributes high quality water to the Susquehanna and, where mixing occurs, improves Susquehanna River quality.

Main Stem - SUQ - 075 above Harrisburg (W.B.)

One half mile downstream from the Rockville Bridge, the number of kinds increased to 16, with a population density of 52 organisms

per square foot. This increase in genera indicated a significant improvement in biological conditions, largely as a result of alkaline flows from the Juniata River.

Conodoquinet Creek Basin - 1 station - enters main stem at mile 71.1

CDQ - 003 at LR21015 near Old Bridge, South of Enola, Pennsylvania

Only one station was sampled on this stream, and it was found to support a diverse bottom organism population. Twenty-two different kinds of organisms were observed, including mayflies, stoneflies, caddisflies, "Unio" mussels, and gill-breathing snails. The presence of luxuriant algal mats and growths of submerged aquatic weeks indicates a high organic nutrient load; however, Conodoquinet Creek contributes good water quality to the Susquehanna River.

Yellow Breeches Creek Basin - 1 station - enters main stem at mile 67.0

YBE - 000 at New Cumberland Borough Park, below dam

Sixteen different kinds of bottom organisms, with 456 organisms per square foot, indicate unpolluted conditions exist in this stream near its mouth. Clean-water associated forms such as stoneflies, mayflies, caddisflies, and hellgrammites, plus numerous fish were further evidence that this was good quality water. This stream contributes good quality water to the Susquehanna River.

Main Stem - SUQ - 064 at Pennsylvania Turnpike Bridge (W.B.), Highspire, Pennsylvania

At the Pennsylvania Turnpike Bridge downstream from New Cumberland, Pennsylvania, the greatest diversification of bottom organisms occurred along the Susquehanna River stations. Seventeen kinds were found, indicating some improvement over the 16 genera obtained at the Rockville Bridge station. The genera present included such clean-water groups as mayflies (two kinds), caddisflies (two kinds), hellgrammites, gill-breathing snails (two kinds), and a type of "Unio" mussel. Large schools of small-mouth bass were observed. Two high quality streams, Conodoquinet Creek and Yellow Breeches Creek enter the Susquehanna River in this reach and help improve Susquehanna River water quality.

West Conewago Creek Basin - 1 station - enters main stem at mile 54.5

WCN - 007 Ganoga Bridge at Pennsylvania Route 295 and LR66002, York County

This stream was sampled about seven miles from its mouth and was found to support 12 genera of bottom organisms (53 per square foot), including caddisflies, "Unio" mussels, and three kinds of mayflies. This stream contributes good quality water to the Susquehanna River.

Codorus Creek Basin - 8 stations - enters main stem at mile 50.1

WCO - 027 South of LR66008 above Spring Grove, Pennsylvania

Codorus Creek is formed by the juncture of its South Branch and West Branch at stream mile 14.1. The West Branch is considered the main stem. The first station on this tributary was located upstream from Spring Grove at mile 27 on the West Branch. Good quality water was indicated by the 18 kinds (genera) of bottom organisms which included clean-water associated caddisflies and mayflies, with a population of 275 per square foot.

WCO - 024 at T-452 Bridge, York County

This station was just below Spring Grove and reflected the results of organic pollution from the Spring Grove area. Only five genera were found, and pollution-tolerant kinds (air-breathing snails and sludgeworms) dominated the population of 646 organisms per square foot.

WCO - 018 at Pennsylvania Route 616 Bridge, North of New Salem, Pennsylvania

About eight miles below Spring Grove, at mile 18, further biological degradation from organic pollution was observed, with a reduction in the number of kinds to four. Again sludgeworms (1,945 per square foot) and air-breathing snails (895 per square foot) constituted the majority of the total bottom organism population of 2,844 organisms per square foot.

WCO - 015 at First Bridge on LR66210 above Indian Rock Dam, York County

This station was just above the confluence of the West Branch with the South Branch Codorus Creek. Only one genera was present;

however, the size of the boulders in the stream did not permit collection of a quantitative sample. This genera was the pollution-tolerant Physa snail, which was very abundant. Organic pollution is still indicated at this station.

SCO - 000 near York, Pennsylvania Pumping Station below dam

The South Branch was sampled near its mouth, and unpolluted biological conditions were found to exist. Thirteen genera of bottom organisms were found in the population of 223. These genera included many clean-water associated forms.

COR - 014 at Pennsylvania Route 182 Bridge above York, Pennsylvania

Codorus Creek was sampled immediately below the confluence of the West Branch and the South Branch, and upstream from the City of York, Pennsylvania. Seven kinds of bottom organisms were found in the population of 35 organisms per square foot. Among these were three kinds of caddisflies. Biological conditions at this station showed an average of the high quality from the South Branch and the low quality from the West Branch.

COR - 006 about two miles below Bridge at intersection of T-839 and LR66021

Below the City of York, significant organic pollution was indicated. Only four kinds of bottom organisms were found, with sludgeworms making up 1,191 of the 1,196 organisms in the quantitative sample.

COR - 001 about 0.5 mile below LR66152 Bridge, York County

At mile 1, Codorus Creek had recovered to the point where it supported 13 kinds of bottom organisms. However, pollution-tolerant Physa sp. snails, sludgeworms, and leeches still predominated. The Susquehanna River receives an organic pollution loading from the inflow of Codorus Creek.

Main Stem - SUQ - 043 at Wrightsville (W.B.) above U. S. 30 Bridge

The last station on the Susquehanna River West Bank was located at Wrightsville, Pennsylvania, opposite the Columbia, Pennsylvania station on the East Bank. The number of kinds of bottom organisms here was reduced to ten, with 245 per square foot. Although clean-water associated forms predominated, with caddisflies (the dominant form),

scuds, mayflies, and gill-breathing snails present, the reduction in number of kinds reflected the deleterious effects of Codorus Creek, which enters in this reach.

Unpolluted biological conditions in the impoundments downstream were indicated by the Fishery Studies, plankton samples, and the National Water Quality Network data at Conowingo, Maryland [See SUQ - 045 (E.B.) on page 11].

TABLE I

BOTTOM ORGANISM DATA

EAST BANK SUSQUEHANNA RIVER AND TRIBUTARIES

| Station Location | Station Code | River Mile | Bottom Organisms Number Of Kinds | Bottom Organisms Number Per Square Foot |
|---|---|---|---|---|
| Susquehanna River | | | | |
| at Danville (E.B.) | SUQ-135 | 135 | 4 | 15 |
| Shamokin Creek | SHM-022 | 120.8 - 22 | 13 | 170 |
| Shamokin Creek | SHM-019 | 120.8 - 19 | 1 | 4 |
| Buddys Run | BUD-000 | 120.8 - 17.6 - 0 | 8 | 500 |
| Shamokin Creek | SHM-000 | 120.8 - 0 | 1 | 4 |
| Susquehanna River | | | | |
| at Hummels Wharf (E.B.) | SUQ-120 | 120 | 6 | 241 |
| Mahanoy Creek | MAH-009 | 112 - 9 | 4 | 4 |
| Schwaben Creek | SCH-000 | 112 - 6.2 - 0 | 12 | 121 |
| Mahanoy Creek | MAH-001 | 112 - 1 | 3 | 3 |
| Susquehanna River | | | | |
| at McKee Half Falls (E.B.) | SUQ-106 | 106 | 7 | 353 |
| Mahantango Creek | MAN-018 | 102.5 - 18 | 13 | 213 |
| Pine Creek | PNE-019 | 102.5 - 17.4 - 19 | 4 | 4 |
| Deep Creek | DCR-009 | 102.5 - 17.4 - 8.4 - 9 | 5 | 5 |
| Pine Creek | PNE-001 | 102.5 - 17.4 - 1.0 | 1 | 1 |
| Mahantango Creek | MAN-010 | 102.5 - 10 | 2 | 2 |
| Mahantango Creek | MAN-000 | 102.5 - 0 | 2 | 2 |
| Wiconisco Creek | WIS-038 | 96.1 - 38 | 0 | 0 |
| Wiconisco Creek | WIS-000 | 96.1 - 0 | 6 | 6 |
| Susquehanna River | | | | |
| at New Buffalo (E.B.) | SUQ-089 | 89 | 12 | 422 |
| Susquehanna River | | | | |
| above Harrisburg (E.B.) | SUQ-075 | 75 | 6 | 9 |
| Susquehanna River | | | | |
| at Pennsylvania Turnpike Bridge (E.B.) | SUQ-064 | 64 | 8 | 35 |
| Swatara Creek | SWA-066 | 60 - 66 | 2 | 2 |
| Swatara Creek | SWA-055 | 60 - 55 | 6 | 25 |
| Swatara Creek | SWA-054 | 60 - 54 | 0 | 0 |

TABLE I (Continued)

| Station Location | Station Code | River Mile | Bottom Organisms Number Of Kinds | Bottom Organisms Number Per Square Foot |
|---|---|---|---|---|
| Swatara Creek | SWA-038 | 60 - 38 | 3 | 3 |
| Little Swatara Creek | LSW-011 | 60 - 37.2 - 11 | 10 | 62 |
| Little Swatara Creek | LSW-001 | 60 - 37.2 - 1 | 13 | 103 |
| Swatara Creek | SWA-014 | 60 - 14 | 8 | 181 |
| Swatara Creek | SWA-002 | 60 - 2 | 11 | 722 |
| East Conewago Creek | CNE-006 | 56.4 - 6 | 13 | 170 |
| Susquehanna River | | | | |
| above Columbia (E.B.) | SUQ-045 | 45 | 9 | 148 |
| Chickies Creek | CHI-001 | 44.3 - 1 | 9 | 479 |
| Conestoga Creek | CON-031 | 31.7 - 31 | 15 | 15 |
| Cocalico Creek | COL-001 | 31.7 - 29.5 - 1 | 11 | 138 |
| Conestoga Creek | CON-024 | 31.7 - 24 | 8 | 132 |
| Conestoga Creek | CON-013 | 31.7 - 13 | 3 | 83 |
| Conestoga Creek | CON-012 | 31.7 - 12 | 17 | 279 |
| Conestoga Creek | CON-001 | 31.7 - 1 | 14 | 460 |
| Pequea Creek | PEQ-006 | 29.5 - 6 | 8 | 134 |
| Pequea Creek | PEQ-001 | 29.5 - 1 | 6 | 92 |

TABLE II

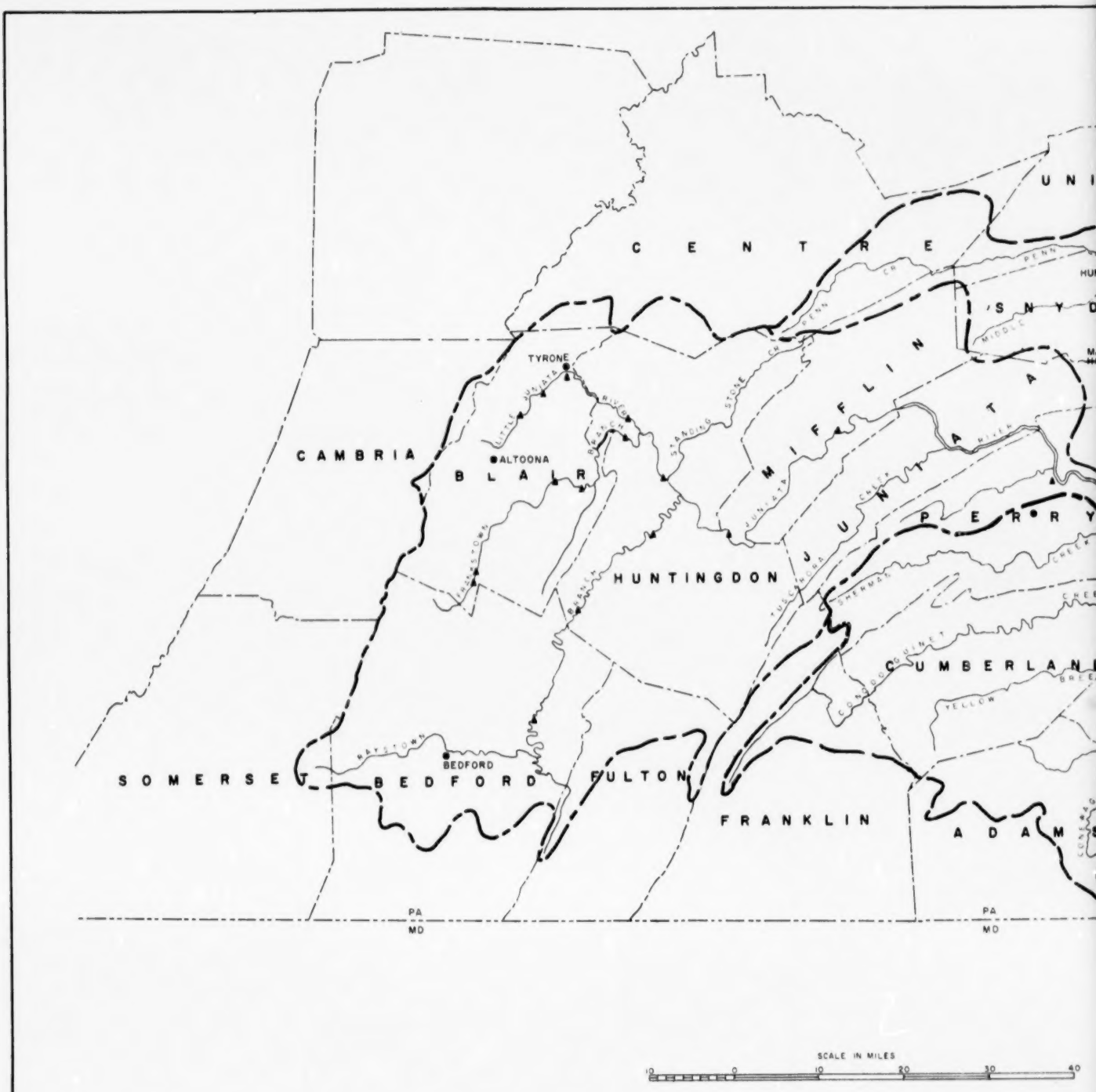
BOTTOM ORGANISM DATA

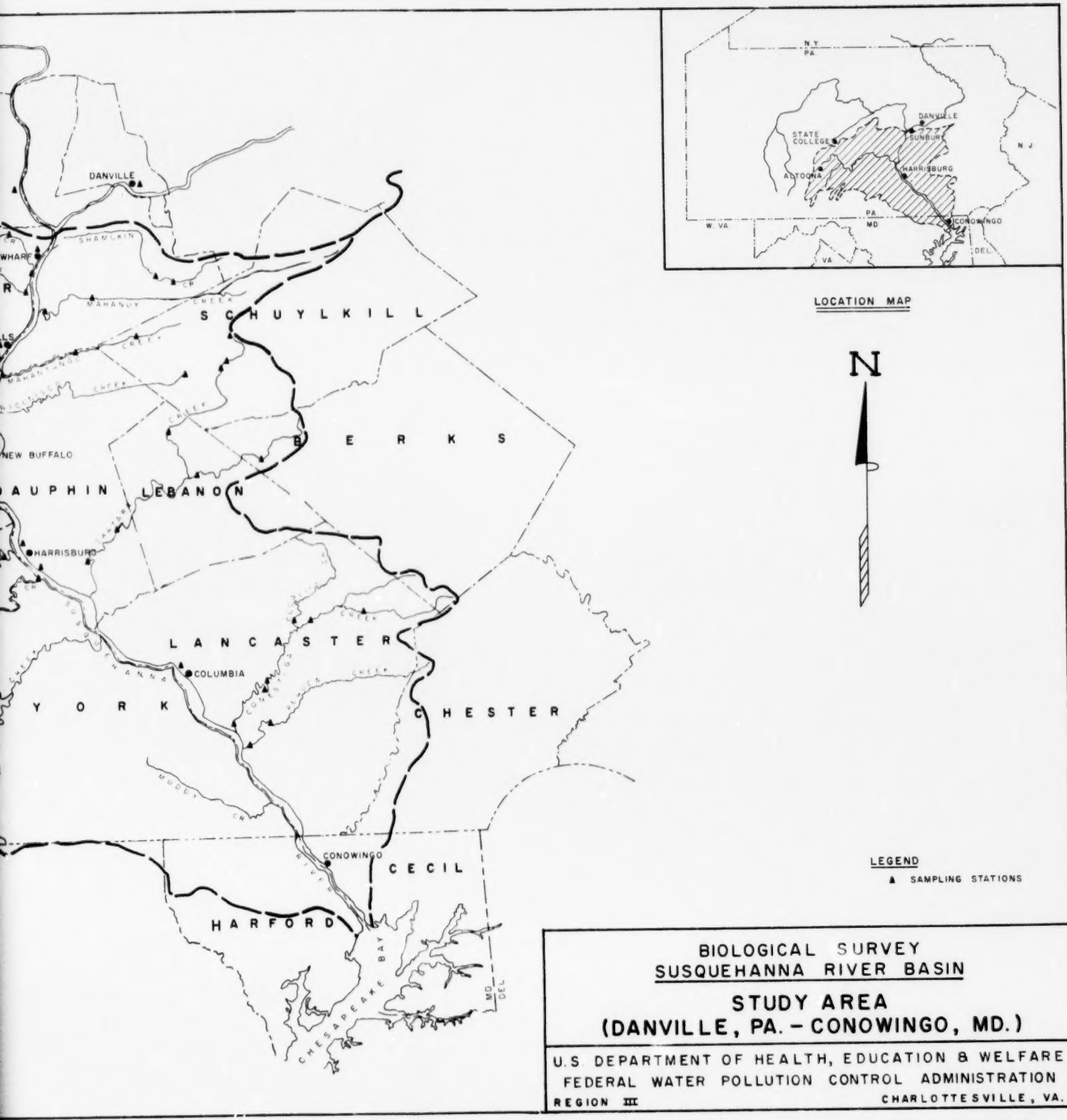
WEST BANK SUSQUEHANNA RIVER AND TRIBUTARIES

| Station Location | Station Code | River Mile | Bottom Organisms Number Of Kinds | Bottom Organisms Number Per Square Foot |
|---|---|---|---|---|
| Susquehanna River | | | | |
| at Danville (W.B.) | SUQ-135 | 135 | 4 | 15 |
| West Branch Susquehanna River at Lewisburg (E.B.) | WBS-008 | 123.5 - 8 | 0 | 0 |
| West Branch Susquehanna River at Lewisburg (W.B.) | WBS-008 | 123.5 - 8 | 12 | 49 |
| Susquehanna River | | | | |
| at Hummels Wharf (W.B.) | SUQ-120 | 120 | 5 | 1,232 |
| Penns Creek | PEN-006 | 113.6 - 6 | 17 | 40 |
| Middle Creek | MID-001 | 113.6 - 2 - 0 | 23 | 427 |
| Penns Creek | PEN-000 | 113.6 - 0 | 9 | 6 |
| Susquehanna River at McKee Half Falls (W.B.) | SUQ-106 | 106 | 10 | 520 |
| Susquehanna River | | | | |
| at New Buffalo (W.B.) | SUQ-089 | 89 | 11 | 485 |
| Little Juniata River | LJU-127 | 84.5 - 127 | 1 | 1 |
| Little Juniata River | LJU-122 | 84.5 - 122 | 4 | 4 |
| Little Juniata River | LJU-118 | 84.5 - 118 | 6 | 19 |
| South Bald Eagle Creek | SBE-003 | 84.5 - 117.4 - 3 | 9 | 263 |
| South Bald Eagle Creek | SBE-000 | 84.5 - 117.4 - 0 | 2 | 2 |
| Little Juniata River | LJU-108 | 84.5 - 108 | 2 | 2 |
| Spruce Creek | SPR-000 | 84.5 - 107.8 - 0 | 19 | 127 |
| Frankstown Branch | FBJ-039 | 84.5 - 101.6 - 39 | 7 | 118 |
| Frankstown Branch | FBJ-038 | 84.5 - 101.6 - 38 | 9 | 532 |
| Frankstown Branch | FBJ-021 | 84.5 - 101.6 - 21 | 9 | 879 |
| Frankstown Branch | FBJ-016 | 84.5 - 101.6 - 16 | 8 | 8 |
| Frankstown Branch | FBJ-004 | 84.5 - 101.6 - 4 | 12 | 46 |
| Juniata River | JUN-094 | 84.5 - 94 | 6 | 58 |
| Raystown Branch | RBJ-043 | 84.5 - 91 - 43 | 13 | 48 |
| Raystown Branch | RBJ-024 | 84.5 - 91 - 24 | 13 | 54 |
| Raystown Branch | RBJ-009 | 84.5 - 91 - 9 | 9 | 241 |

TABLE II (Continued)

| Station Location | Station Code | River Mile | Bottom Organisms Number Of Kinds | Bottom Organisms Number Per Square Foot |
|---|---|---|---|---|
| Juniata River | JUN-082 | 84.5 - 82 | 13 | 58 |
| Aughwick Creek | AUG-030 | 84.5 - 77.7 - 30 | 14 | 54 |
| Aughwick Creek | AUG-005 | 84.5 - 77.7 - 5 | 13 | 75 |
| Juniata River | JUN-052 | 84.5 - 52 | 12 | 102 |
| Kishacoquillas Creek | KIS-006 | 84.5 - 46.8 - 6 | 10 | 77 |
| Kishacoquillas Creek | KIS-000 | 84.5 - 46.8 - 0 | 7 | 471 |
| Juniata River | JUN-012 | 84.5 - 12 | 20 | 221 |
| Susquehanna River above Harrisburg (W.B.) | SUQ-075 | 75 | 16 | 52 |
| Conodoquinet Creek | CDQ-003 | 71.1 - 3 | 22 | 124 |
| Yellow Breeches Creek | YBE-000 | 67 - 0 | 16 | 456 |
| Susquehanna River at Pennsylvania Turnpike Bridge (W.B.) | SUQ-064 | 64 | 17 | 461 |
| West Conewago Creek | WCN-007 | 54.5 - 7 | 12 | 53 |
| West Branch Codorus Creek | WCO-027 | 50.1 - 27 | 18 | 275 |
| West Branch Codorus Creek | WCO-024 | 50.1 - 24 | 5 | 646 |
| West Branch Codorus Creek | WCO-018 | 50.1 - 18 | 4 | 2,844 |
| West Branch Codorus Creek | WCO-015 | 50.1 - 15 | 1 | 1 |
| South Branch Codorus Creek | SCO-000 | 50.1 - 14.1 - 0 | 13 | 223 |
| Codorus Creek | COR-014 | 50.1 - 14 | 7 | 35 |
| Codorus Creek | COR-006 | 50.1 - 6 | 4 | 1,196 |
| Codorus Creek | COR-001 | 50.1 - 1 | 13 | 436 |
| Susquehanna River at Wrightsville (W.B.) | SUQ-043 | 43 | 10 | 245 |


C E N T R E
CAMBRIA
TYRONE
ALTOONA
B L A I R
HUNTINGDON
M I F F L I N
J U N I A T A
P E R R Y
SOMERSET
B E D F O R D
BEDFORD
F U L T O N
FRANKLIN
PA
MD
PA
MD
SCALE IN MILES
10 0 10 20 30 40

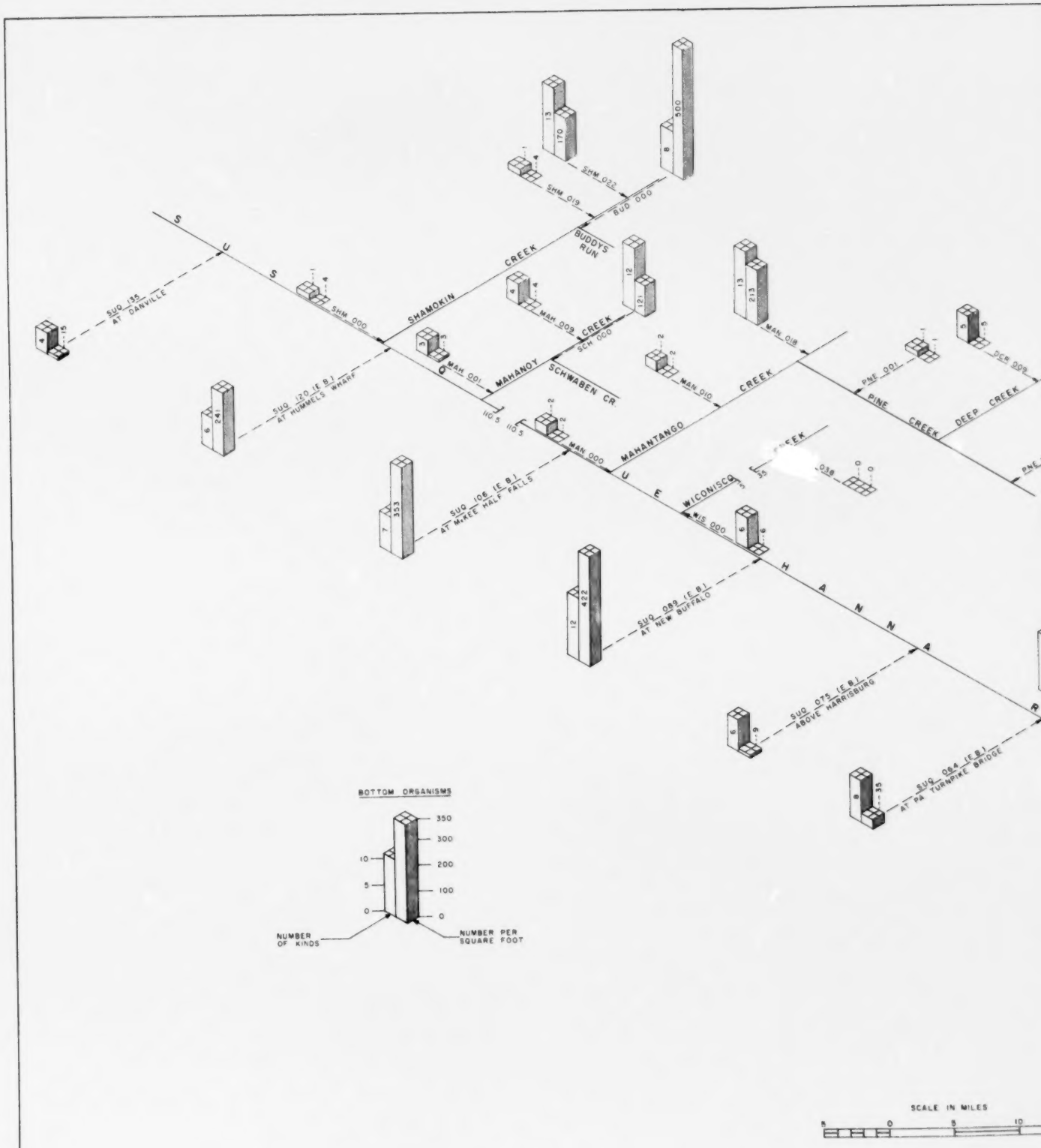


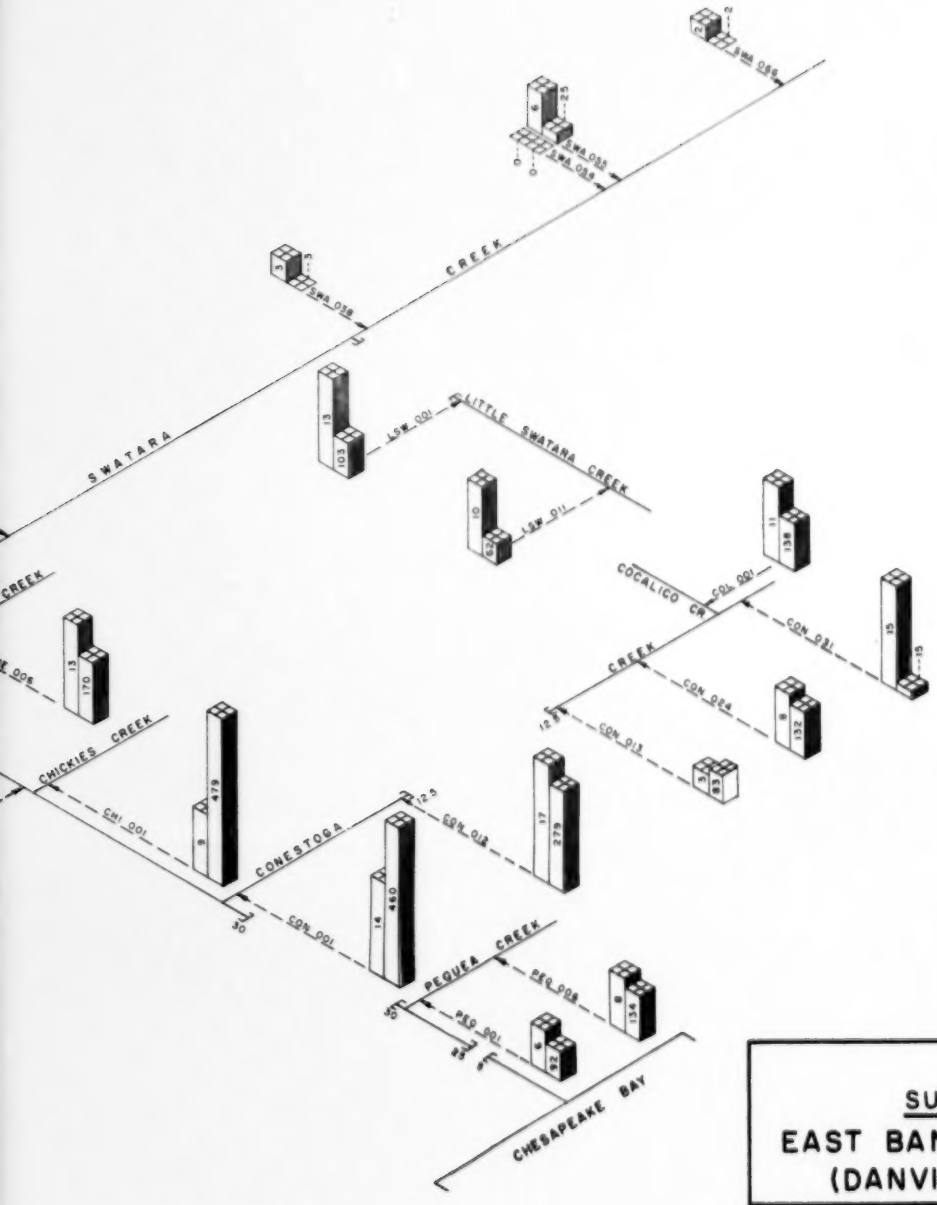

BIOLOGICAL SURVEY
SUSQUEHANNA RIVER BASIN

# STUDY AREA
# (DANVILLE, PA. – CONOWINGO, MD.)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
REGION III — CHARLOTTESVILLE, VA.

FIGURE 1


SUQ 135
AT DANVILLE
SUSQUEHANNA
SHM 000
SHAMOKIN
CREEK
SHM 019
SHM 022
BUD 000
BUDDYS
RUN
MAH 001
MAHANOY
CREEK
MAH 008
SCH 000
SCHWABEN CR.
SUQ 120 (E.B.)
AT HUMMELS WHARF
MAN 000
MAHANTANGO
CREEK
MAN 010
MAN 018
PNE 001
PINE
CREEK
DEEP CREEK
PCR 009
SUQ 106 (E.B.)
AT McKEE HALF FALLS
WIS 000
WICONISCO
CREEK
SUQ 089 (E.B.)
AT NEW BUFFALO
SUQ 075 (E.B.)
ABOVE HARRISBURG
SUQ 064 (E.B.)
AT PA TURNPIKE BRIDGE
BOTTOM ORGANISMS
NUMBER
OF KINDS
NUMBER PER
SQUARE FOOT
SCALE IN MILES

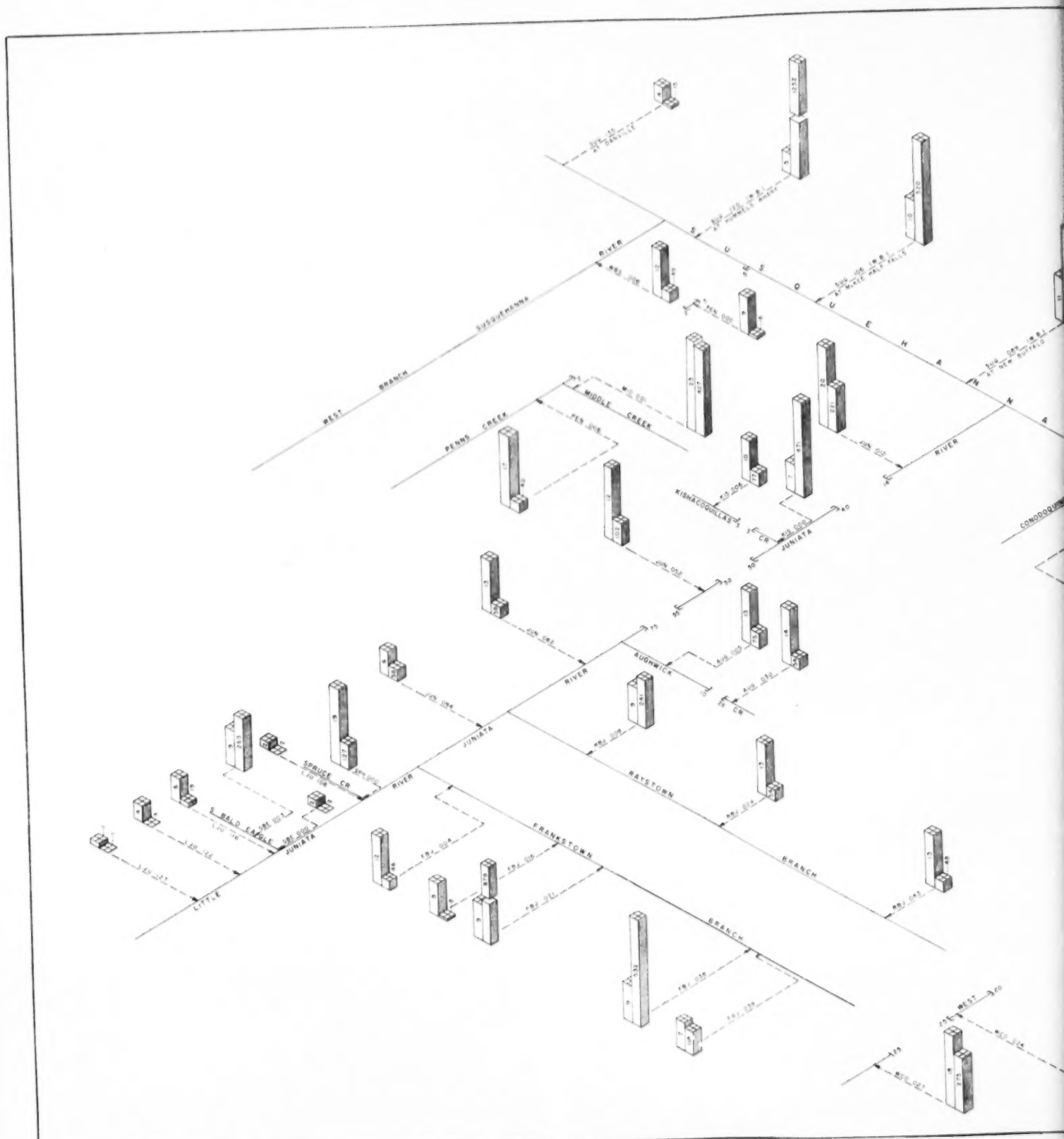


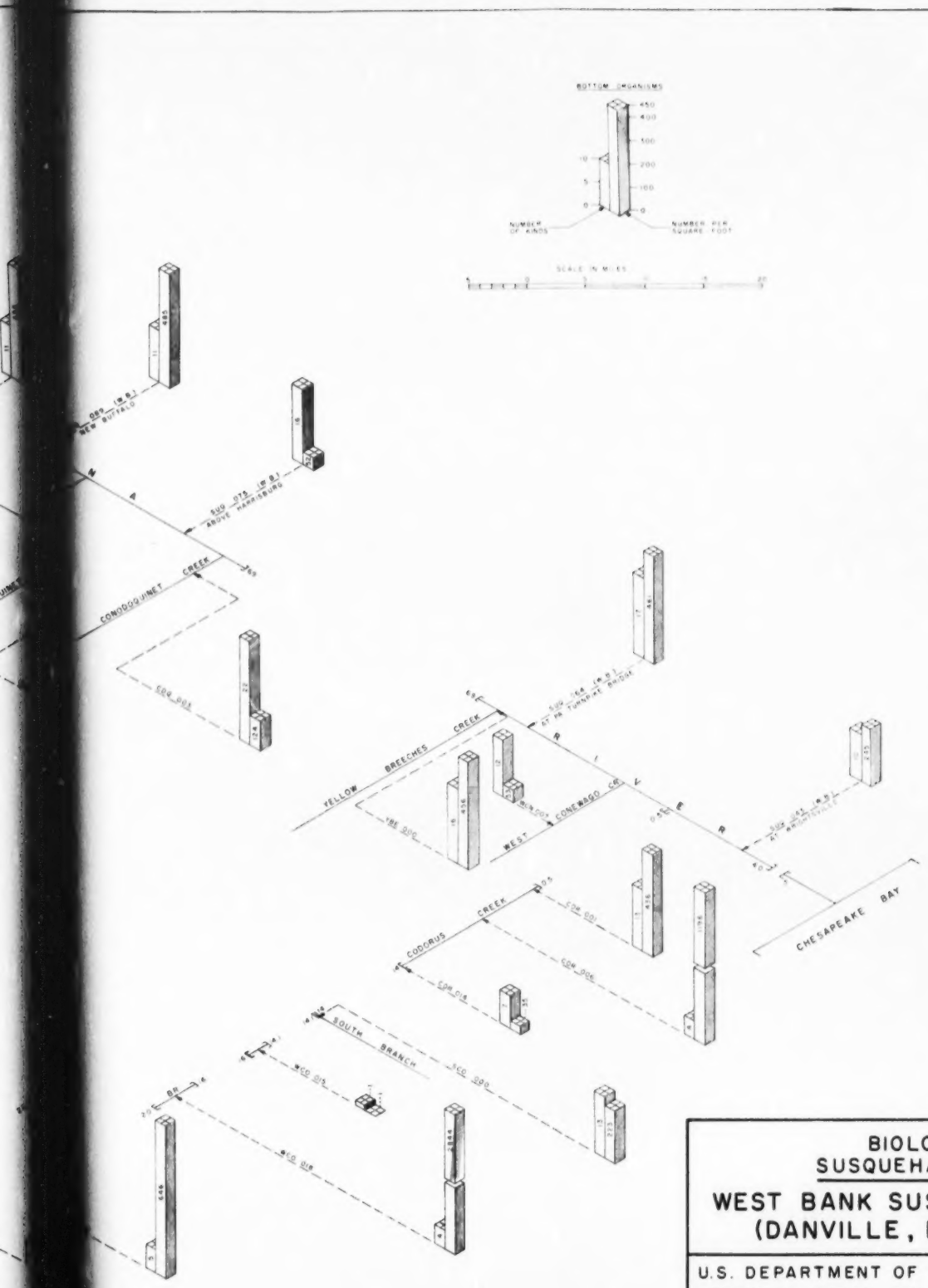

BIOLOGICAL SURVEY
SUSQUEHANNA RIVER BASIN

# EAST BANK SUS. RIVER & TRIBUTARIES (DANVILLE, PA. – CONOWINGO, MD.)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
REGION III — CHARLOTTESVILLE, VA.

FIGURE 2


WEST BRANCH SUSQUEHANNA RIVER
PENNS CREEK
MIDDLE CREEK
KISHACOQUILLAS CR
JUNIATA
SUSQUEHANNA
RIVER
CONODOGUINET
AUGHWICK CR
JUNIATA RIVER
SPRUCE CR
S. BALD EAGLE
JUNIATA
LITTLE
RAYSTOWN BRANCH
FRANKSTOWN BRANCH
WEST




BIOLOGICAL SURVEY
SUSQUEHANNA RIVER BASIN

# WEST BANK SUS. RIVER & TRIBUTARIES (DANVILLE, PA. – CONOWINGO, MD.)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
REGION III — CHARLOTTESVILLE, VA.

FIGURE 3